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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/823,196 | 04/12/2004 | Kiran Kumar Kuchi | 875.0132.U1(US) | 4038 |

29683 7590 01/15/2010

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| EXAMINER | |
|---|---|
| NGUYEN, LEON VIET Q | |
| ART UNIT | PAPER NUMBER |
| 2611 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 01/15/2010 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/823,196 | KUCHI ET AL. | |
| | Examiner | Art Unit | |
| | LEON-VIET Q. NGUYEN | 2611 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *30 November 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,7,13,14,18,19,25-39,41-58,60,61 and 66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,13,14,18,19,29-33,36,38,41-43,48-52,55,57,60,61 and 66-71* is/are rejected.

7)☒ Claim(s) *25-28,34,35,37,39,44-47,53,54,56 and 58* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

1. This office action is in response to communication filed on 11/30/09. Claims 1, 13, 14, 18, 19, 25-39, 41-58, and 60, 61, and 66-71 are pending on this application.

### *Response to Arguments*

2. Applicant's arguments, see Remarks, filed 11/30/09, with respect to the rejection(s) of claim(s) 1, 13, 14, 18, 19, 29-33, 36, 38, 41-43, 48-52, 55, 57, and 60, 61, and 66-71 under 35 USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Mayor et al (US20040042535).

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**2. Claims 1, 13, 14, 18, 19, 29-33, 36, 38, 41-43, 48-52, 55, 57, 60, 61 and 66-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (US20020015437) in view of Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002,**

**Volume 1 page(s): 541- 545), Olsson et al (US20050111596) and Mayor et al (US20040042535).**

Re claim 1, Li teaches a method comprising:

receiving a composite wireless communication signal (¶0077) by a receiver (fig. 3);

splitting a corresponding complex composite base band received signal into an inphase domain and quadrature domain portion (fig. 6, the signal is divided into I and Q portions); and

performing, on the split corresponding complex base band received signal (signals I and Q in fig. 6), joint signal detection in inphase domain and quadrature domain (fig. 6, ¶0034. Joint detection is performed on the I and Q signals by each matched filter), where the joint signal detection operates to suppress interference from the interfering signal (although not explicitly taught, interference suppression is a well known feature of joint detection).

Li fails to teach where the joint signal detection comprises performing pre-filtering ad reduced state sequence estimation separately on the inphase domain portion and the quadrature domain portion. However Zhang teaches where the joint signal detection (fig. 1) comprises performing pre-filtering (page 542 left side first paragraph and right side first paragraph) and reduced state sequence estimation (page 542 right side first paragraph, JRSSE in fig. 1). Zhang does not explicitly teach that the joint detection is performed on inphase and quadrature symbols. However Zhang does

teach that the system is an EDGE system (page 541 right side last paragraph). It is well know that EDGE signals comprise an I and Q portion. It would be obvious to perform the pre-filtering and estimation on both I and Q portions of the received signal.

Therefore taking the combined teachings of Li and Zhang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Zhang into the method of Li. The motivation to combine Zhang and Li would be to provide near-optimal performance at very low complexity (page 541 right side first paragraph of Zhang).

Li also fails to teach where the composite wireless communication signal comprises a desired signal and an interfering signal. However Olsson teaches receiving a signal where the composite wireless communication signal (fig. 14) comprises a desired signal and an interfering signal (¶0028).

Therefore taking the combined teachings of Li and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Li. The motivation to combine Li and Olsson would be to eliminate the degradation in 8PSK-modulated interference and give a large gain over a conventional receiver (¶0063 of Olsson).

Li also fails to teach where joint signal detection occurs separately in inphase domain and quadrature domain. However Mayor teaches separately processing in-

phase and quadrature signals with respective matched filters (¶0028). Li teaches that matched filters are used for joint detection (see ¶0045 and ¶0072 of Li).

Therefore taking the combined teachings of Li and Mayor as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Mayor into the method of Li. The motivation to combine Li and Mayor would be to offer superior performance with respect to severe channel phase distortions (¶0017 of Mayor).

Re claim 13, the modified invention of Li teaches a system in which said base station transmits two transmission signals on the same channel (¶0034 and ¶0063 of Olsson, transmitting a desired GMSK-modulated signal and an 8PSK-modulated signal which results in co-channel interference). It is well known in the art that co-channel interference is crosstalk from two different radio transmitters reusing the same frequency channel.

Re claim 14, the modified invention of Li teaches a system in which said two transmissions signals comprise two GMSK signals (fig. 13 of Olsson, ¶0027 of Olsson), two 8PSK signals or one GMSK and one 8PSK signal.

Re claim 18, the claimed limitations recited have been analyzed and rejected with respect to claim 1. It is well known in the art that MIMO systems (abstract of Zhang) utilize spatially separated antennas.

Re claim 19, the claimed limitations recited have been analyzed and rejected with respect to claim 1.

Re claim 29, the modified invention of Li teaches a method where joint pre-filtering comprises using a set of feed forward weights (page 542, right side, first paragraph of Zhang, equation 6 of Zhang. $W^H$ is a matrix comprising pre-filter weights) to minimize an error term (page 542, right side, first paragraph of Zhang, equation 6 of Zhang) that includes a MIMO feedback filter (page 542, right side, first paragraph of Zhang, equation 6 of Zhang. $B^H$ is a matrix comprising feed back filter weights), wherein a feed forward filter separately filters the inphase domain portion and the quadrature domain portion (it is well known that a filter would filter the imaginary and real part of an 8PSK modulated signal).

Re claim 30, the modified invention of Li teaches a method where joint pre-filtering comprises optimizing filter coefficients according to a minimum mean square

error (MMSE) criterion (page 542, right side, first paragraph of Zhang, equation 7 of Zhang).

Re claim 31, the modified invention of Li teaches a method where reduced state sequence estimation comprises use of a reduced state soft output sequence estimation (JRSSE in fig. 1 of Zhang) that employs a branch metric comprised of inphase domain and quadrature domain components of the corresponding complex composite base band received signal (page 541, left side, second paragraph of Zhang. The system is used in an EDGE system with 8PSK modulation. It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary. Since the composite signal comprises of I and Q components, it is interpreted that the I-Q symbol streams of the composite signal are detected).

Re claim 32, the modified invention of Li teaches a method where said steps of receiving, splitting, and performing are performed in an 8PSK blind I-Q interference suppression receiver (¶0042-¶0043 of Olsson, the blind modulation detection of a desired signal. Also in an EDGE system, signals of either GMSK or 8PSK modulation are present) when a GMSK interferer is present (¶0043 of Olsson, an interferer is GMSK-modulated).

Re claim 33, the modified invention of Zhang teaches where said steps of receiving, splitting, and performing are performed in GMSK-8PSK or 8PSK-GMSK (fig. 14 of Olsson, ¶0028 of Olsson. The desired signal is GMSK modulated and the interferer is 8PSK modulated) minimum mean square error (MMSE) joint detection receiver (abstract of Zhang).

Re claim 36, the modified invention of Li teaches a method further comprising sequentially estimating desired and dominant interfering signal channel impulse responses (page 542, right side, first paragraph of Zhang. It would be obvious to one of ordinary skill in the art that the impulse response be estimated before it is shortened and reshaped. Furthermore it is well known in the art that in joint equalization systems, data and interference are both detected), where channel estimation blindly identifies a dominant interferer modulation type (¶0043-¶0044 of Olsson) and its training sequence (¶0042 of Olsson).

Re claim 38, the modified invention of Zhang teaches a method where identifying the dominant interferer modulation type and training sequence comprises searching through known training sequences (¶0042 of Olsson, the position and content of the

training sequence is well known. Furthermore it is well known in the art that the training sequence incoming of an incoming signal is compared to known training sequences to achieve synchronization), and analyzing residual signals to identify a type of dominant interference (¶0044 of Olsson, decision mechanism 18 in fig. 7).

Re claim 41, the modified invention of Li teaches a method further comprising detecting (¶0043 of Olsson) whether operation of the device is in a first mode in which the interfering signal is to be discarded (fig. 14 and ¶0028 of Olsson) or in a second mode in which the desired signal and the interfering signal are to be processed as data (fig. 13 and ¶0027 of Olsson, in GMSK-GMSK modulation schemes both signals are processed as data), where in the first mode, the interfering signal is to be discarded (¶0063 of Olsson, the 8PSK-modulated interference is eliminated).

Re claim 42, the claimed limitations recited have been analyzed and rejected with respect to claim 1. Li teaches the device as taught by the method.

Re claim 43, the modified invention of Li teaches a device where said receiver is coupled to a plurality of receive antennas (fig. 1 of Zhang, receive antennas 1 to N).

Re claim 48, the claimed limitations recited have been analyzed and rejected with respect to claim 29.

Re claim 49, the claimed limitations recited have been analyzed and rejected with respect to claim 30.

Re claim 50, the claimed limitations recited have been analyzed and rejected with respect to claim 31.

Re claim 51, the claimed limitations recited have been analyzed and rejected with respect to claim 32.

Re claim 52, the claimed limitations recited have been analyzed and rejected with respect to claim 33.

Re claim 55, the claimed limitations recited have been analyzed and rejected with respect to claim 36.

Re claim 57, the claimed limitations recited have been analyzed and rejected with respect to claim 38.

Re claim 60, the claimed limitations recited have been analyzed and rejected with respect to claim 41.

Re claim 61, the modified invention of Li teaches a system in which two transmission signals are transmitted by the same base station using two antennas or are transmitted by a plurality of base stations each using one antenna (fig. 15 of Olsson).

Re claim 66, the modified invention of Li teaches a device where the composite wireless communication signal is received by the receiver (fig. 1 of Zhang) from each of at least two spatially separated transmit antennas associated with at least one transmitter or from at least two transmitters (abstract of Zhang, it is well known in the art

that in MIMO systems antenna diversity is used. Antenna diversity uses multiple spatially separated antennas).

Re claim 67, the modified invention of Li teaches where the receiver receives desired information from each of the at least two spatially separated transmit antennas (abstract of Zhang, this is a well known feature of MIMO systems).

Re claim 68 the claimed limitations recited have been analyzed and rejected with respect to claim 41.

Re claim 69, the modified invention of Li teaches a device where the composite wireless communication signal comprises two signals that are received on a same channel and where the two signals comprise two GMSK signals (fig. 13 of Olsson, ¶0027 of Olsson), two 8PSK signals or one GMSK signal and one 8PSK signal.

Re claim 70, the modified invention of Li teaches a device where the processor is further configured to estimate channel parameters of the interfering signal by calculating channel parameters for all combinations of a desired signal and of said interfering signal

(¶0043 of Olsson) and selecting the channel parameters that meet a criterion (¶0044 of Olsson).

Re claim 71, the modified invention of Li teaches a device where the receiver is further configured to receive channel parameters of an interfering signal (¶0043 of Olsson).

***Allowable Subject Matter***

3. Claims 25-28, 34, 35, 37, 39, 44-47, 53, 54, 56 and 58 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON-VIET Q. NGUYEN whose telephone number is (571)270-1185. The examiner can normally be reached on Monday-Friday, alternate Friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon-Viet Q Nguyen/
Examiner, Art Unit 2611

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611